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9 July 1964
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FOURTH MONTHLY PROGRESS REPORT

JUNE 1964

MICRODENSITOMETER CAPABILITY AND INTERPRETATION STUDY

This report covers activities through the fourth month of a microdensitometer capability and interpretation study. The objectives of the study are: (1) the establishment of techniques which enable a microdensitometer operator to use the instrument to its maximum capability and to interpret the data therefrom accurately; (2) a survey of existing instruments to study the most recent developments in microdensitometry; and (3) a study of the feasibility and effectiveness of various advances in the state-of-the-art.

Each of the three tasks have been continued through the reporting period. Several phases of the tasks have been completed. Attachments to this document report the results of the completed parts. As of the end of the month, the percentage expenditure to date was 48%.

I.   Mensuration Procedures and Data Interpretation

The primary emphasis on Task I has been on the application of microdensitometry to photographic system performance analysis, light source coherence effects, and grain scattering effects on density determination.

Photographs were produced with different amounts of image motion introduced synthetically. Edge trace data were processed by an IBM 704 computer program, developed under Task III. Preliminary results indicate, as expected, that the half-width of the line spread function obtained by the computer program corresponds to the amount of image motion present on the photograph.

Declass Review by NIMA/DOD

To allow accurate measurement of image dimensions, a relationship has been derived for the location of undegraded edges from analysis of their degraded images. This derivation is included as Attachment 1 to this report. Progress to date on the investigation of the influences of the degree of coherence of the illuminating light upon images of edges is included as Attachment 2 to this report. (This memo also discusses concurrent internal research studies of partial coherence.)

The dependence of measured density on source÷detector specularity will be described in two memos. One is a theoretical determination for the no scattering case. The other deals with experimental determination for the case where scattering is present. The first memo is included as Attachment 3 to this report.

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II.   Equipment Capability

The complete results of the survey, prior to any trips, are presented in Attachment 4 to this report. A schedule has been initiated for the trips to manufacturers' facilities to evaluate the instruments. The first trip will be to the ▓▓▓▓▓▓▓▓▓▓▓▓▓▓ on 8-9 July. A tentative list of trips is included as Attachment 5. A set of tests has been devised for the purpose of evaluating the instruments. Attachment 6 to this report describes these tests in detail.

III.   Feasibility Studies   STATINTL

A comparison is being made between transfer functions of ▓▓▓▓▓▓▓TL Model 4 microdensitometer obtained by edge trace analysis and by scanning sine wave test charts. Although the analysis is not complete, initial results indicate agreement between the methods. These results do not agree with ▓▓▓▓ published results for their Model 4 microdensitometer. We plan to obtain a description of ▓▓▓▓▓ analysis procedure during the trip to ▓▓▓▓ this month.   STATINTL

STATINTL   Work has been initiated on the visual display. As a start, an analysis of the optical system of the ▓▓▓ instrument, i.e. image dimensions and location of principal planes and field stops, is being conducted for the purpose of determining where the necessary components for the visual display can best be placed in such a system.   STATINTL

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ATTACHMENTS

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1. Precise Location of Edges from Degraded Images, ██████████ HH:bb:279

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2. Results of Theoretical Studies of the Influence of the Degree of Coherence Upon Images of Edges, ████████ RK:bb:283

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3. Variation of Photographic Density with Numerical Aperture for a Non-scattering Emulsion, ████████ HH:bb:291-pa

4. Survey of Recording Microdensitometers, ██████████ GN:bb:323 STATINTL

5. Trips to Various Microdensitometer Manufacturers, ██████████ NTL
MJM:bb:315

6. Microdensitometer Evaluation Tests, ██████████ MM:bb:282 STATINTL